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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/508,748	02/07/2005	Giulio Alberti	26332	8351
20529 7590 NATH & ASSOCIATES 112 South West Street Alexandria, VA 22314			EXAMINER BERNSHTEYN, MICHAEL	
			ART UNIT	PAPER NUMBER
			1713	
SHORTENED STATUTORY PERIOD OF RESPONSE		MAIL DATE	DELIVERY MODE	
3 MONTHS		04/05/2007	PAPER	

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/508,748

Applicant(s)

ALBERTI ET AL.

Examiner

Michael Bernshteyn

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-33 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-3 and 21-23 is/are rejected.
- 7) ☒ Claim(s) 4-20 and 24-33 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 September 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 01/11/06, 02/07/05.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: ____.

DETAILED ACTION

Claim Objections

1. Claims 4-20 and 24-33 are objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim cannot depend from any other multiple dependent claims. See MPEP § 608.01(n). Accordingly, the claims 4-9 and 24-33 have not been further treated on the merits.
2. Claim 6 is objected to because of the following informalities: the word "arylene" should have letter "e" at the end. Appropriate correction is required.
3. Claims 2 and 3 are objected to because of the following informalities: the use of the phrases "preferably", "more preferably", etc. to link a broad range of values with a narrow range of values renders the claims awkward and not in the compliance with the current US practice. It is not clear which range controls the actual metes and bounds of the claimed subject matter. It is suggested to put preferable range in the dependent claims. Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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4. Claims 1-3 and 21-23 are rejected under 35 U.S.C. 102(a) as being anticipated by Bauer et al. (WO 03/077340 A2). The U.S. Patent 7,108,935 is equivalent to the WO 03/077340 A2, therefore the following rejection is based upon the context of U.S. Patent 7,108,935.

With regard to the limitations of claims 1-3 and 21-23, Bauer discloses composite membrane materials comprising a polymer of the state of art uniformly filled with a zirconium phosphate, preferably α -zirconium phosphate or zirconium phosphate sulfoarylenphosphonate particels. The composite membrane materials are preferably prepared starting from a solution of a polymer of the state of art and from a colloidal dispersion of α -zirconium phosphate or a zirconium phosphate sulfoarylenphosphonate. The colloidal particles are transferred into the solution of the polymer preferably by mixing the dispersion with the solution or by means of phase transfer. The membrane material is preferably obtained by removing the solvent by evaporation or by a suitable non-solvent. Besides the composite membrane materials and the preparation methods, the use of the above membrane materials is claimed as ionomeric membranes with high overall performance in high temperature, especially hydrogen, and in indirect methanol fuel cells and with decreased methanol crossover in direct methanol fuel cells (abstract).

Bauer discloses that it is known from the literature (G. Alberti, M. Casciola, U. Costantino, A. Peraio, E. Montoneri, Solid State Ionics 50 (1992) 315; G. Alberti, L. Boccali, M. Casciola, L. Massinelli, E. Montoneri, Solid State Ionics 84 (1996) 97) that some α - or γ -layered zirconium phosphate sulfoarylenphosphonates exhibit proton conductivity up about 0.1 S cm^{-1} . These compounds are represented by the general

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formulae $\text{Zr}(\text{O}_3\text{POH})_{2-x}(\text{O}_3\text{P--Ar})_x \cdot n\text{H}_2\text{O}$, with $0 < x \leq 2$ (α -type compounds), or $\text{Zr}(\text{PO}_4)(\text{O}_2\text{P}(\text{OH})_2)_{1-x}(\text{HO}_3\text{P--Ar})_x \cdot n\text{H}_2\text{O}$, with $0 < x \leq 1$ (γ -type compounds), where Ar is an arylsulfonated group.

These compounds are substantially identical to the claimed insoluble compounds of instant claim 1.

Bauer discloses that both amorphous and α - or γ -layered zirconium phosphate as well as zirconium phosphate metasulfoarylenphosphonates form stable colloidal dispersions in some **organic solvents** (e.g. N,N'-dimethylformamide (DMF), N-methyl-2-pyrrolidone (NMP), dimethylsulfoxide, acetonitrile, alkanols) or in their mixtures with water (col. 3, lines 3-9).

Bauer discloses that conductivity of a modified zirconium phosphate, especially zirconium phosphate sulfoarylenphosphonate, containing membrane material is $>10^{-2} \text{ S cm}^{-1}$ at 70°C and 95% relative humidity, which is within the claimed range (col. 3, lines 41-44).

The preparation of a colloidal dispersion of α -zirconium phosphate or of a proton conducting zirconium phosphate sulfoarylenphosphonate in a suitable solvent or mixture of solvents, and in the subsequent transfer of the colloidal particles into a solution of a polymer, especially an ionomer, of the state of art. The mixture thus obtained is cast on the surface of a smooth plane support and the solvent is removed by heating or by using a suitable non-solvent. Transfer of the colloidal particles into the polymer, especially ionomer, solution can be carried out (1) by mixing the polymer, especially the ionomer, solution with the colloidal dispersion or (2) by means of "phase

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transfer". It is possible to use noncharged polymers as conductivity is contributed by the zirconium phosphate. Preferably there are used ionomers, especially sulfonated polymers due to their conductivity at low temperatures (<100°C.). There can be used **perfluorosulfonic polymers**, especially Nafion, Hyflon or Sterion, **sulfonated polyvinylidenefluoride**, **sulfonated polyetherketones**, especially sPEK, sPEEK, sPEKK, sPPEK, sPEEKK or sPEKEKK, sulfonated polybenzimidazoles, sulfonated polysulfones sulfonated polyphenylsulfones and **sulfonated polyethersulfones**. In case (1) the same solvent can be used for the solution and the dispersion. Alternatively, if different solvents are used for the solution and the dispersion, it must be avoided that the solvent of the polymer may provoke colloid flocculation and the solvent of the colloidal dispersion may cause polymer precipitation (col. 3, line 58 through col. 4, line 18).

5. Claims 1-3 are rejected under 35 U.S.C. 102(a) as being anticipated by Alberti et al. (U. S. Patent 5,892,080).

With regard to the limitations of claims 1-3, Alberti discloses solid mesoporous crystalline composition of diphosphonate-phosphite of a tetravalent metal, with a limited distribution of mesopores having the formula (abstract):



wherein: M is a tetravalent metal, R is a bivalent organic radical, x varies from 0.3 to 0.6, y varies from 0.05 to 0.3. The process for its production is described, together with its uses and a solid catalyst containing $-SO_3H$ acid groups, active in the conversion processes of hydrocarbons, which can be obtained from said mesoporous crystalline composition by treatment with a sulfonicphosphonic or arylphosphonic acid, followed, only in the case of treatment with arylphosphonic acid, by sulfonation with a sulfonating agent.

In particular, in the above formula, M is a **tetravalent metal**, which can be conveniently selected from **zirconium**, **titanium** and tin, and is preferably zirconium owing to the greater stability to hydrolysis of the relative composition (col. 2, lines 54-61). R is selected from aliphatic bivalent organic radicals containing from 2 to 10 carbon atoms in the molecule, or aromatic radicals containing from 1 to 2 non-condensed rings, or from alkylaromatic radicals. Specific examples of R radical are: $--CH_2CH_2--$, $--CH_2--(CH_2)_2--CH_2--$, $--CH_2--(CH_2)_4--CH_2--$, $--C_6H_4--$, $--C_6H_4--C_6H_4--$, $--CH_2--C_6H_4--CH_2--$, $--CH_2--C_6H_4--C_6H_4--CH_2--$. Preferred examples of the R radical are $--C_6H_4--$ and $--CH_2(CH_2)_2--CH_2--$ (col. 2, lines 58-61).

The preferred oxychloride of a tetravalent metal is selected from zirconyl **chloride** octahydrate and zirconyl **chloride** monohydrate (col. 3, lines 50-52).

Alberti discloses that the solvent can be water, or an **organic solvent**, or a mixed water/organic solvent, preferably dioxane (col. 5, lines 22-25).

6. Claims 1-3 and 21-23 are rejected under 35 U.S.C. 102(b) as being anticipated by Grot et al. (U.S. Patent 5,919,583).

Grot discloses cation exchange membranes, made from polymer having cation exchange groups and containing inorganic filler, exhibit reduced fuel crossover for fuel cells employing direct feed organic fuels such as methanol and, when inorganic proton conductor is employed, enhanced proton conductivity (abstract).

With regard to the limitations of claims 1-3 and 21-23, Grot discloses that zirconium hydrogen phosphate $Zn(HPO_4)_2$ can be precipitated in a membrane of perfluorinated sulfonic acid polymer (preferably in acid form) by soaking the membrane

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in an aqueous solution of containing zirconium ions, e.g., 1-5M zirconyl chloride, for a time and at a temperature sufficient to penetrate the membrane solution (col. 7, lines 8-15, example 1, col. 10, line 64 through col. 11, line 42). The cation exchange groups are preferably selected from the group consisting of sulfonate, carboxylate, phosphonate, imide, sulfonamide and sulfonamide groups (col. 3, lines 29-35).

The membrane may optionally include a porous support for the purposes of improving mechanical properties, for decreasing cost and/or other reasons. The porous support of the membrane may be made from a wide range of components. The porous support of the present invention may be made from a hydrocarbon such as a polyolefin, e.g., polyethylene, polypropylene, polybutylene, copolymers of those materials, and the like. Perhalogenated polymers such as polychlorotrifluoroethylene may also be used. For resistance to thermal and chemical degradation, the support preferably is made of a highly fluorinated polymer, most preferably **perfluorinated polymer** (col. 5, lines 1-12).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Bernshteyn whose telephone number is 571-272-2411. The examiner can normally be reached on M-F 8-5:30.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu can be reached on 571-272-1114. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Michael Bernshteyn
Patent Examiner
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03/27/2007


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